CLAIMS

1. A method of forming an orifice plate for a fluid ejection device, the method comprising:

depositing and patterning a mask material on a conductive surface;

forming a first layer on the conductive surface, the first layer including a metallic material;

forming a second layer on the first layer, the second layer including a polymer material; and

removing the first layer and the second layer from the conductive surface.

2. The method of claim 1, wherein forming the first layer includes electroforming the first layer on the conductive surface.

3. The method of claim 2, wherein electroforming the first layer includes electroplating the conductive surface with the metallic material.

4. The method of claim 1, wherein forming the first layer includes forming the first layer over a portion of the mask material and providing at least one opening through the first layer to the mask material.

5. The method of claim 4, wherein forming the second layer includes depositing the polymer material over the first layer and within the at least one opening of the first layer, and patterning the polymer material to define at least one opening through the second layer and the first layer to the mask material.

6. The method of claim 1, wherein forming the first layer includes defining an orifice in the first layer with the mask material and providing a first opening through the first layer to the mask material, the first opening communicated with the orifice and a dimension of the orifice being defined by the mask material,

and wherein forming the second layer includes providing a second opening through the second layer, the second opening communicated with the first opening.

7. The method of claim 6, wherein patterning the mask material includes defining a diameter of the orifice, wherein the diameter of the orifice is greater than a minimum diameter of the first opening.

8. The method of claim 6, wherein providing the second opening includes defining a diameter of the second opening, wherein the diameter of the second opening is greater than a minimum diameter of the first opening.

9. The method of claim 1, wherein the metallic material of the first layer includes one of nickel, copper, an iron/nickel alloy, palladium, gold, and rhodium.

10. The method of claim 1, wherein the polymer material of the second layer includes a photoimageable polymer.

11. The method of claim 1, further comprising:
forming a protective layer over the first layer.

12. The method of claim 11, wherein the metallic material of the first layer includes one of nickel, copper, and an iron/nickel alloy, and the protective layer includes one of palladium, gold, and rhodium.

13. A method of forming an orifice plate for a fluid ejection device, the method comprising:
depositing and patterning a mask material on a surface;
forming a first layer on the surface, including forming the first layer over a portion of the mask material and providing at least one opening through the first layer to the mask material; and

forming a second layer on the first layer, including depositing a material over the first layer and within the at least one opening of the first layer, and patterning the material to define at least one opening through the second layer and the first layer to the mask material.

14. The method of claim 13, wherein forming the first layer includes electroplating the surface with a metallic material.

15. The method of claim 14, wherein the metallic material includes one of nickel, copper, an iron/nickel alloy, palladium, gold, and rhodium.

16. The method of claim 13, wherein forming the second layer includes depositing a polymer material over the first layer and within the at least one opening of the first layer, and patterning the polymer material to define the at least one opening through the second layer and the first layer to the mask material.

17. The method of claim 16, wherein the polymer material includes a photoimageable polymer.

18. The method of claim 13, wherein forming the first layer includes defining an orifice in the first layer with the mask material and providing a first opening through the first layer to the mask material, the first opening communicated with the orifice and a dimension of the orifice being defined by the mask material, and wherein forming the second layer includes providing a second opening through the second layer, the second opening communicated with the first opening.

19. The method of claim 18, wherein patterning the mask material includes defining a diameter of the orifice, wherein the diameter of the orifice is greater than a minimum diameter of the first opening.

20. The method of claim 18, wherein providing the second opening includes defining a diameter of the second opening, wherein the diameter of the second opening is greater than a minimum diameter of the first opening.

21. The method of claim 13, further comprising:
removing the first layer and the second layer from the surface.

22. The method of claim 13, further comprising:
forming a protective layer over the first layer.

23. The method of claim 22, wherein the protective layer includes one of palladium, gold, and rhodium.

24. An orifice plate for a fluid ejection device, the orifice plate comprising:
a first layer formed of a metallic material and having a first side and a second side opposite the first side, the first layer having an orifice defined in the first side thereof and a first opening defined in the second side thereof, the first opening communicating with the orifice; and
a second layer formed of a polymer material and having a second opening defined therethrough, the second layer disposed on the second side of the first layer and the second opening communicating with the first opening,
wherein a diameter of the orifice and a diameter of the second opening are both greater than a minimum diameter of the first opening.

25. The orifice plate of claim 24, wherein the second layer is formed after the first layer.

26. The orifice plate of claim 24, wherein the first layer is electroformed and the second layer is deposited on the first layer.

27. The orifice plate of claim 24, wherein the metallic material of the first layer includes one of nickel, copper, an iron/nickel alloy, palladium, gold, and rhodium.

28. The orifice plate of claim 24, wherein the polymer material of the second layer includes a photoimageable polymer.

29. The orifice plate of claim 24, further comprising:
a protective layer disposed on the first side of the first layer.

30. The orifice plate of claim 29, wherein the protective layer is provided within the orifice and the first opening of the first layer.

31. The orifice plate of claim 29, wherein the metallic material of the first layer includes one of nickel, copper, and an iron/nickel alloy, and the protective layer includes one of palladium, gold, and rhodium.

32. The orifice plate of claim 24, wherein the first layer and the second layer each have a thickness in a range of approximately 5 microns to approximately 25 microns.

33. The orifice plate of claim 24, wherein the first layer and the second layer each have a thickness of approximately 13 microns.

34. A fluid ejection device, comprising:
a substrate having a fluid opening formed therethrough;
a drop generator formed on the substrate; and
an orifice plate extended over at least a portion of the drop generator, wherein the orifice plate includes a first layer formed of a metallic material and a second layer formed of a polymer material,

wherein the first layer has an orifice and a first opening communicated with the orifice formed therein, and the second layer has a second opening communicated with the first opening formed therein, and

wherein a diameter of the orifice and a diameter of the second opening are both greater than a minimum diameter of the first opening.

35. The device of claim 34, wherein the second opening of the second layer forms a fluid chamber for the drop generator, wherein the fluid chamber communicates with the fluid opening of the substrate.

36. The device of claim 34, wherein the drop generator includes a firing resistor formed within a thin-film structure, wherein the thin-film structure is adjacent to the substrate and the orifice plate is supported by the thin-film structure.

37. The device of claim 36, wherein the orifice plate is adhered to a bonding layer, wherein the bonding layer is adjacent to the thin-film structure.

38. The device of claim 34, wherein the first layer of the orifice plate is electroformed and the second layer of the orifice plate is deposited on the first layer after the first layer is formed.

39. The device of claim 34, wherein the metallic material of the first layer of the orifice plate includes one of nickel, copper, an iron/nickel alloy, palladium, gold, and rhodium.

40. The device of claim 34, wherein the polymer material of the second layer of the orifice plate includes a photoimageable polymer.

41. The device of claim 34, wherein the orifice plate further includes a protective layer disposed on a side of the first layer.

42. The device of claim 41, wherein the protective layer is provided within the orifice and the first opening of the first layer of the orifice plate.

43. The device of claim 41, wherein the metallic material of the first layer of the orifice plate includes one of nickel, copper, and an iron/nickel alloy, and the protective layer of the orifice plate includes one of palladium, gold, and rhodium.

44. The device of claim 34, wherein the first layer and the second layer of the orifice plate each have a thickness in a range of approximately 5 microns to approximately 25 microns.

45. The device of claim 34, wherein the first layer and the second layer of the orifice plate each have a thickness of approximately 13 microns.